

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-46

Name: Belle Fourche Reservoir

County: Butte

Legal description: Sec. 1, 2, 3, 7, 11-14, 19, 23-26, 29, T 9N, R 3E

Location from nearest town: 9 miles east of Belle Fourche, SD

Dates of present survey: May 22-24, July 29-31, August 16, 2013

Date last surveyed: May 21-22, 2012, July 30-August 2, 27, 2012

Management classification: Warmwater permanent

Primary Species: (game and forage)

1. Walleye
2. Channel Catfish
3. Gizzard Shad
4. Black Crappie
5. _____
6. _____
7. _____

Secondary and other species:

1. Yellow Perch
2. Smallmouth Bass
3. White Bass
4. Longnose Sucker
5. Spottail Shiner
6. Common Carp
7. Tiger Muskellunge

PHYSICAL CHARACTERISTICS

Surface Area: 8,063 acres

Watershed: 2,867,200 acres

Maximum depth: 55 feet

Mean depth: 25 feet

Lake elevation at survey (from known benchmark): approximately 50% capacity

Ownership of lake and adjacent lakeshore property

The United States Bureau of Reclamation (BOR) and the Belle Fourche Irrigation District perform the operation and maintenance of Orman Dam and Belle Fourche Reservoir water levels. The South Dakota Department of Game, Fish and Parks, Division of Wildlife manages the reservoir's fish populations and 164 acres of land below the dam grade for wildlife production and the Division of Parks manages 350 acres around the boat ramp (Sec. 24, 25 T9N R3E). The BOR also manages 6,617 acres around the reservoir as wildlife habitat and for public access although irrigation has priority for water rights.

Fishing Access

Boat access is good, though crowded conditions exist as only one boat ramp is available on the largest reservoir west of the Missouri river. Shore access is generally good with public access available around the lake. An additional ramp was installed in Fall 2013 on the northwest shore of Rocky Point. Water levels do recede in summer and fall due to irrigation, and the slow tapering shoreline can become muddy and not conducive to good shore fishing. The inlet, however, does provide good shoreline access most of the year.

Observations of Water Quality and Aquatic Vegetation

Aquatic vegetation is limited to smartweed in shallow areas in the bays and inlets areas.

Observations on conditions of structures (i.e. spillway, boat ramps and docks, roads)

All structures appear to be in excellent condition. The boat ramps, campground area and fish cleaning facilities are maintained by Rocky Point State Park.

FISH POPULATION MANAGEMENT OBJECTIVES

Objective 1. Maintain a Walleye fishery with a minimum of 20 fish per gill net, a PSD range of 30-60, increase PSD-P to 10 or greater, and maintain a mean growth rate near 35.5 cm (14 in) at age-3.

Objective 2. Maintain or supplement the Gizzard Shad population through annual adult stockings of approximately 100 adults.

Objective 3. Maintain a population of Yellow Perch as another potential Walleye forage source and sportfish for anglers through adult stockings every two to three years.

Objective 4. Reintroduce Bluegill, as a potential forage source for Walleye and sportfish for anglers, by summer of 2013.

BIOLOGICAL DATA

Sampling Effort and Catch

Age-0 Fish Survey

Daytime boat electrofishing was used on August 16, 2013 to index Gizzard Shad reproduction. Electrofishing was done using a boat mounted Smith-Root unit with pulsed-DC. Sampling consisted of ten stations totaling 1.17 hours of electrofishing. No other age-0 fish were collected during this survey so all further discussion is included with the Gizzard Shad section of this report.

Adult Fish survey

Trap nets were used on May 22-24 and experimental gill nets on July 29-31, 2013 to sample adult fish populations in the reservoir (Figure 1). Trap nets were modified fyke nets consisting of a 1.3 X 1.5 m frame, 19.1 mm (0.75 in) mesh and a 1.2 X 23 m (3.9 X 75.5 ft) lead. The gill nets were experimental-type measuring 45.7 m (150 ft) long and 1.8 m (6 ft) deep with six 7.6 m (25 ft) panels with bar mesh sizes: 12.7 mm (0.5 in), 19.1 mm (0.75 in), 25.4 mm (1 in), 31.8 mm (1.25 in), 38.1 mm (1.5 in), and 50.8 mm (2.0 in). The trap net sampling consisted of five nets ran for two nights each due to excessive winds, and totaled 10 trap net nights. Gill netting consisted of five gill net nights. Catch data for trap nets is in Table 1 and for gill nets in Table 2. Discussion on selected fish species follows and completes this report.

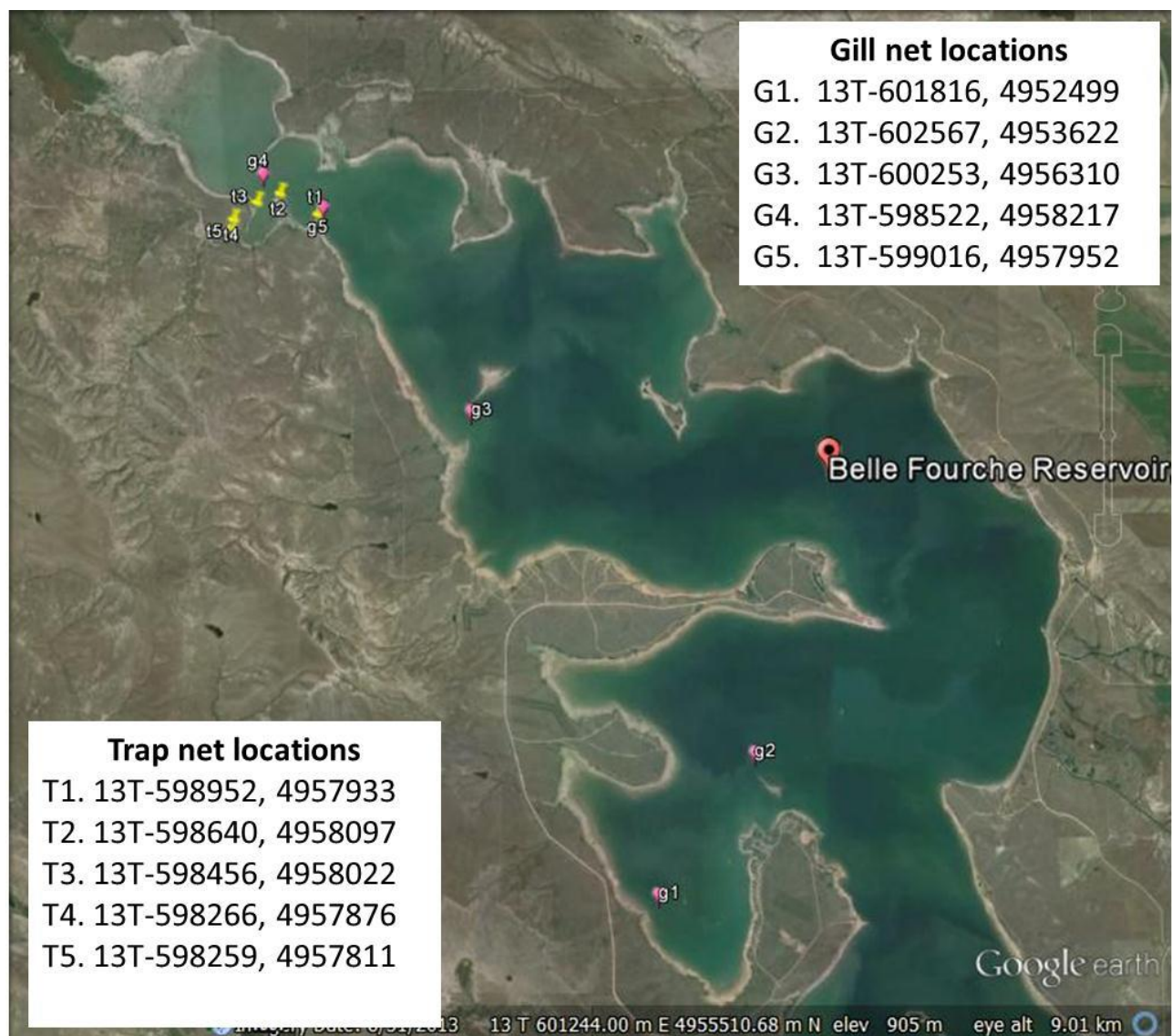


Figure 1. Locations, including GPS coordinates, of experimental gill nets (g1, g2, g3, g4, g5) and trap nets (t1, t2, t3, t4, t5) during the fisheries survey on Belle Fourche Reservoir, Butte County, South Dakota, 2013.

Table 1. Catch data from all species collected in five trap nets set for two days in Belle Fourche Reservoir, Butte County, May 22-24, 2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Black Crappie	10	1.0 (1.0)	1.0 (1.0)	100	80 (24)	90.1 (4.2)
Channel Catfish	2	0.2 (0.2)	0.1 (0.2)	--	--	80.7 (--)
Common Carp	14	1.4 (0.5)	1.4 (0.5)	100	50 (25)	87.5 (1.8)
Gizzard Shad	2	0.2 (0.2)	0.2 (0.2)	--	--	116.2 (--)
River Carpsurcker	6	0.6 (0.6)	0.6 (0.6)	--	--	108.6 (7.3)
European Rudd	1	0.1 (0.2)	0.1 (0.2)	--	--	--
Shorthead Redhorse	2	0.2 (0.2)	0.2 (0.2)	--	--	85.4 (8.2)
Walleye	13	1.3 (0.9)	1.3 (0.9)	100	31 (24)	74.1 (3.7)
White Bass	17	1.7 (1.9)	1.7 (1.9)	100	100	86.8 (2.3)
White Crappie	198	19.8 (16.9)	19.8 (16.9)	100	99 (1)	93.3 (1.2)

Table 2. Catch data from all species collected in five gill nets in Belle Fourche Reservoir, Butte County, July 29-31, 2013. CPUE's are listed with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* are listed with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Channel Catfish	19	3.8 (1.1)	3.8 (1.1)	84 (15)	5 (9)	89.8 (2.0)
Common Carp	8	1.6 (1.4)	1.4 (1.4)	100	29 (35)	84.1 (4.9)
Freshwater Drum	7	1.4 (1.4)	1.4 (1.4)	71 (35)	14 (28)	100.7 (5.3)
Gizzard Shad	2	0.4 (0.4)	0.4 (0.4)	--	--	116.6 (30.5)
River Carpsucker	3	0.6 (0.6)	0.6 (0.6)	--	--	107.6 (2.1)
Shorthead Redhorse	15	3.0 (1.9)	3.0 (1.9)	73 (21)	40 (23)	99.9 (2.6)
Smallmouth Bass	6	1.2 (1.2)	1.2 (1.2)	--	--	102.4 (6.8)
Spottail Shiner	34	6.8 (4.1)		--	--	--
Walleye	127	25.4 (8.0)	24.6 (8.0)	44 (7)	1 (1)	84.8 (0.1)
White Bass	17	3.4 (3.0)	3.4 (3.0)	100	82 (17)	100.6 (3.5)
Yellow Perch	21	4.2 (1.6)	3.4 (1.5)	76 (18)	6 (10)	96.3 (2.7)

Channel Catfish

Channel Catfish catch numbers were similar to the past few years with a mean gill net catch per unit effort (CPUE) of 3.8 (Tables 2 and 3). Only two Channel Catfish were captured in the trap net sample. The length frequency histogram shows a larger size structure with few smaller fish indicating very little recruitment (Figure 2). Stock density values indicated similar findings with a proportional stock density (PSD) of 84. Fish condition was below average, with a mean relative weight for stock length and larger (*Wr*>S) Channel Catfish of 89.8.

Table 3. Composite listing of data for Channel Catfish collected by gill nets in Belle Fourche Reservoir, Butte County 2009-2013. CPUE's are listed with 80% confidence intervals in parentheses. PSD and PSD-P and $Wr_{\geq S}$ are listed with 90% confidence intervals in parentheses.

Year	N	CPUE	PSD	PSD-P	$Wr_{\geq S}$
2009	14	1.8 (0.9)	77 (22)	0	91.2 (2.7)
2010	32	4.0 (1.1)	84 (--)	6 (--)	88.2 (1.7)
2011	23	2.9 (0.9)	87 (12)	13 (12)	85.6 (2.8)
2012	28	4.0 (1.2)	96 (6)	7 (9)	86.8 (1.9)
2013	19	3.8 (1.1)	84 (15)	5 (9)	89.8 (2.0)

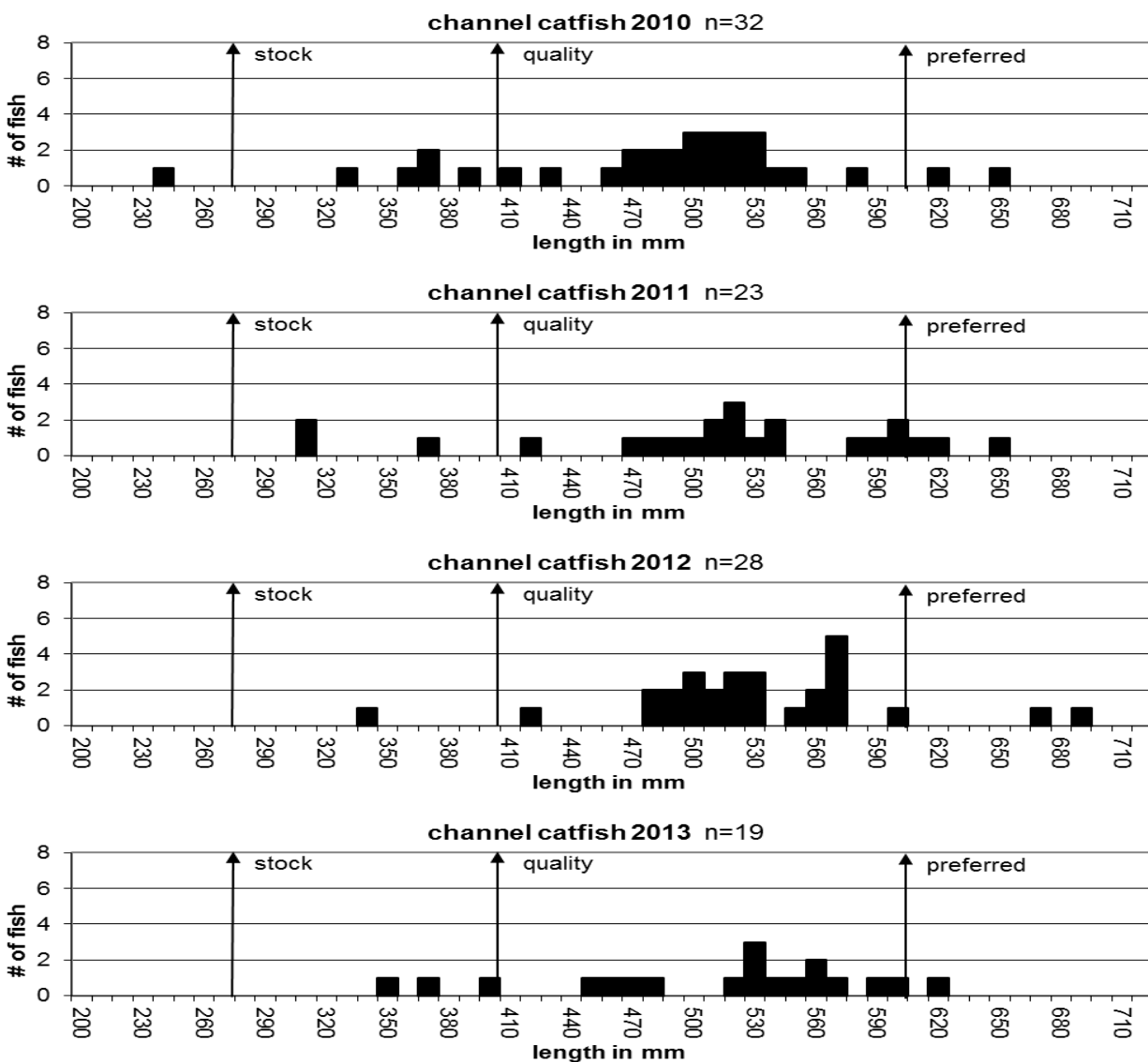


Figure 2. Length frequencies of Channel Catfish collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2010-2013.

Gizzard Shad

Gizzard Shad were re-introduced into Belle Fourche Reservoir in 1997 and adult stockings are accomplished annually to promote natural reproduction in expectation that adult biomass will be reduced by winter conditions. Gizzard Shad were re-introduced in attempt to provide an additional forage fish for Walleye and improve Walleye growth rates.

In 2013, gill net catch per unit effort for stock length and larger (CPUE-S) Gizzard Shad was 0.4 (Table 2). Age-0 Gizzard Shad are collected through daytime boat electrofishing and numbers have been highly variable during sampling (Table 4). Daytime boat electrofishing yielded a mean CPUE of 1,229.9 (Table 4). This is the highest recorded since 2007.

Table 4. Year, number captured (N), time in hours (hrs), and catch per unit effort (CPUE) for daytime electrofishing catch of age-0 Gizzard Shad from the Belle Fourche Reservoir, Butte County, South Dakota, 2005-2013.

Year	N	Time (hrs)	CPUE
2005	763	0.83	919.3
2006	3,112	0.83	3,749.4
2007	1,179	0.83	1,420.5
2008	185	1.00	185.0
2009	319	1.30	255.2
2010	41	1.70	24.1
2011	81	1.25	64.8
2012	54	1.42	38.0
2013	1,439	1.17	1,229.9

Walleye

Walleye abundance appears to have increased in 2013 as gill net CPUE increased to 25.4, compared to 17.9 last year (Tables 2 and 5). Size structure has remained the same as PSD was 44 the last two years. The number of fish over 510 mm (20 in) remains low with a PSD-P of 1, also the same as last year. The length frequency histogram and stock density values indicate a fairly balanced population with good recruitment (Figure 3).

Fish condition improved with an average $Wr_{\geq S}$ of 84.8, compared to 78.2 last year. This may be a reflection of the excellent Gizzard Shad reproduction observed this year, which likely resulted in increased forage availability. Growth was good with the average four year old fish measuring 381 mm at time of capture (Table 6).

Table 5. Composite listing of data for Walleye collected by gill nets in Angostura Reservoir 2006-2013. CPUE's are listed with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
2006	110	27.5 (15.7)	25.3 (14.9)	45 (9)	0	81.5 (0.2)
2007	114	19.0 (10.5)	14.0 (8.4)	69 (8)	0	80.2 (0.6)
2008	101	16.8 (6.7)	16.2 (6.1)	46 (9)	1 (2)	79.8 (0.1)
2009	62	7.8 (2.4)	6.1 (1.9)	71 (11)	0	82.5 (0.8)
2010	80	10.0 (4.0)	9.0 (3.7)	68 (9)	1 (3)	76.5 (0.6)
2011	65	8.1 (2.2)	8.0 (2.2)	50 (10)	3 (4)	77.1 (0.2)
2012	125	17.9 (5.0)	16.3 (4.8)	44 (8)	1 (1)	78.2 (0.2)
2013	127	25.4 (8.0)	24.6 (8.0)	44 (7)	1 (1)	84.8 (0.1)

Table 6. Age, minimum, maximum total length at capture and weighted mean length-at-age, determined from otoliths collected from Walleye in experimental gill nets in Belle Fourche Reservoir, Butte County, South Dakota, July 29-31, 2013. Values are in millimeters.

Age	Minimum total Length	Weighted mean Length at capture	Maximum total length	Number of fish in survey
1	201	201	201	1
2	260	290	332	37
3	330	354	372	11
4	343	381	423	31
5	366	402	460	19
6	420	444	476	3
7	418	466	502	12
8	429	429	429	1
10	451	460	468	2
12	458	460	462	2
13	466	466	466	1

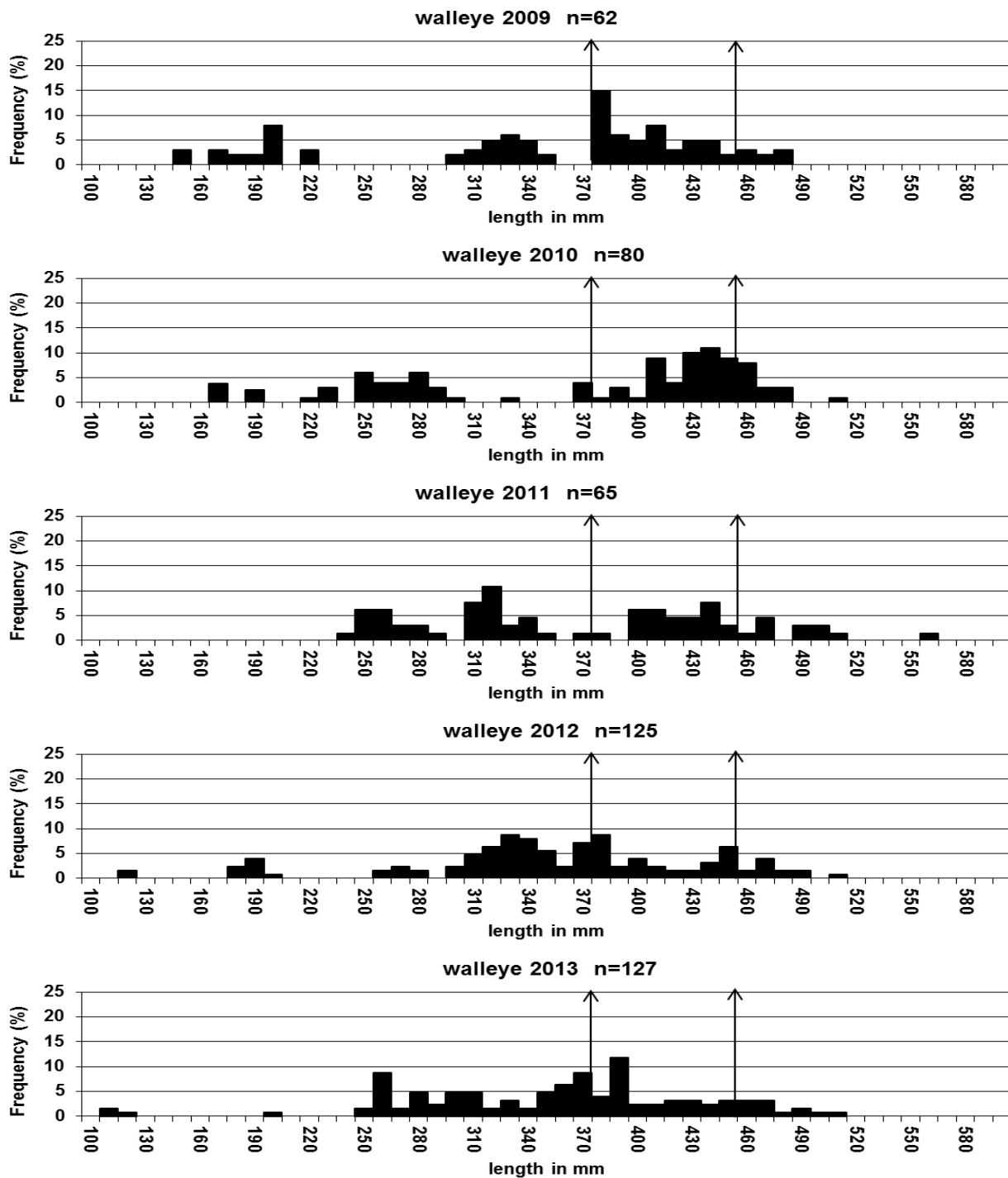


Figure 3. Length frequencies for Walleye caught in experimental gill nets in Belle Fourche Reservoir, Butte County, South Dakota, 2009-2013. The arrows represent the protected slot limit (15 in to 18 in).

Yellow Perch

Yellow Perch numbers continue to decline with a gill net CPUE of 4.2 (Tables 2 and 7). This is the lowest recorded in the last five years. The length frequency shows recruitment and a balanced population with multiple year classes present (Figure 4). Fish condition was good with a *Wr* of 96.3 (Table 2).

Table 7. Year, number sampled (N), catch per unit effort (CPUE) and catch per unit effort of fish stock size and larger (CPUE-S) for Yellow Perch collected by experimental gill net in Belle Fourche Reservoir, Butte County, South Dakota, 2009-2013.

Year	N	CPUE	CPUE-S
2009	331	41.4 (13.0)	10.9 (3.8)
2010	269	33.6 (17.2)	14.9 (7.7)
2011	69	8.6 (4.2)	7.3 (3.6)
2012	87	12.4 (3.2)	8.6 (2.7)
2013	21	4.2 (1.6)	3.4 (1.5)

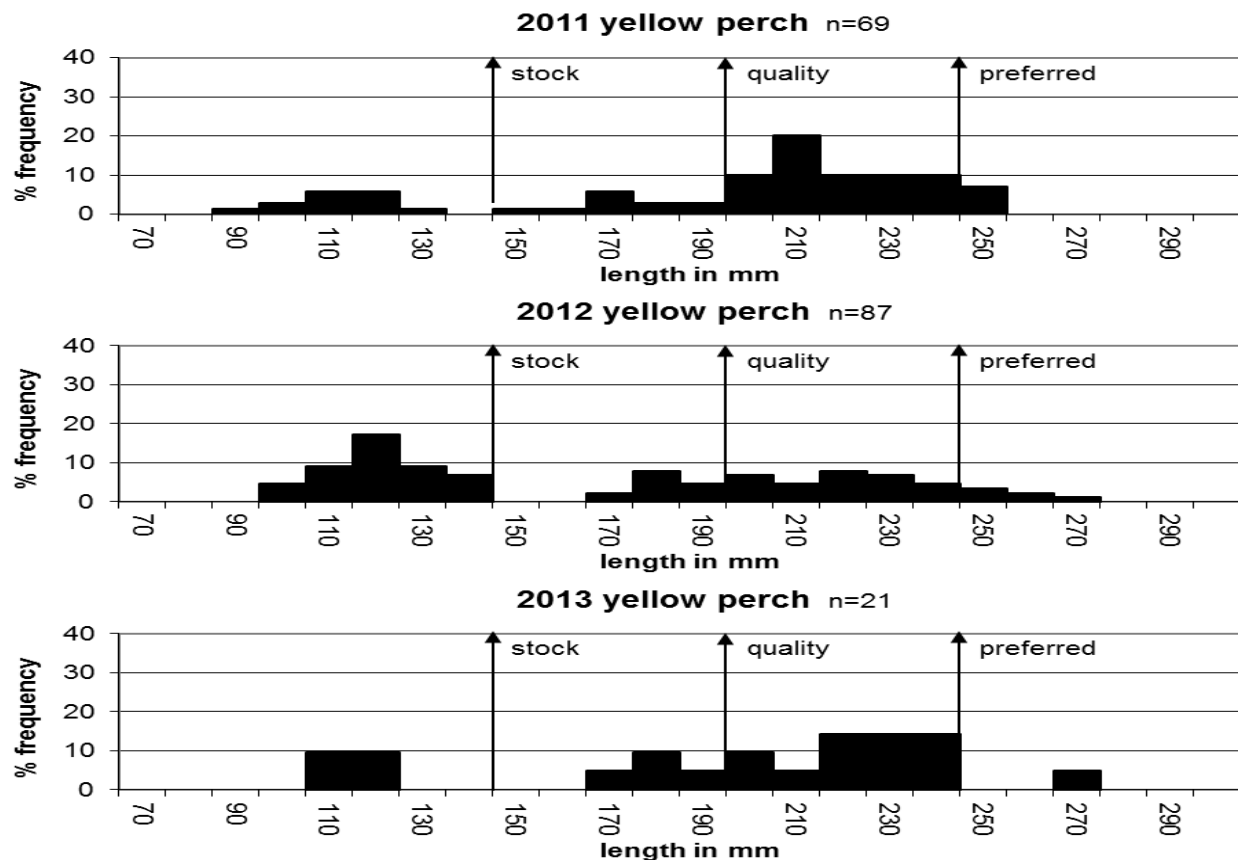


Figure 4. Length frequencies of Yellow Perch collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2011-2013.

White Crappie

White Crappie trap net CPUE was 19.8 (Table 1). Fish condition was good with average *Wr* at 93.3 for stock-length and larger fish. The length frequencies do not show recruitment in recent years with a good number of fish between 270-300 mm (Figure 5).

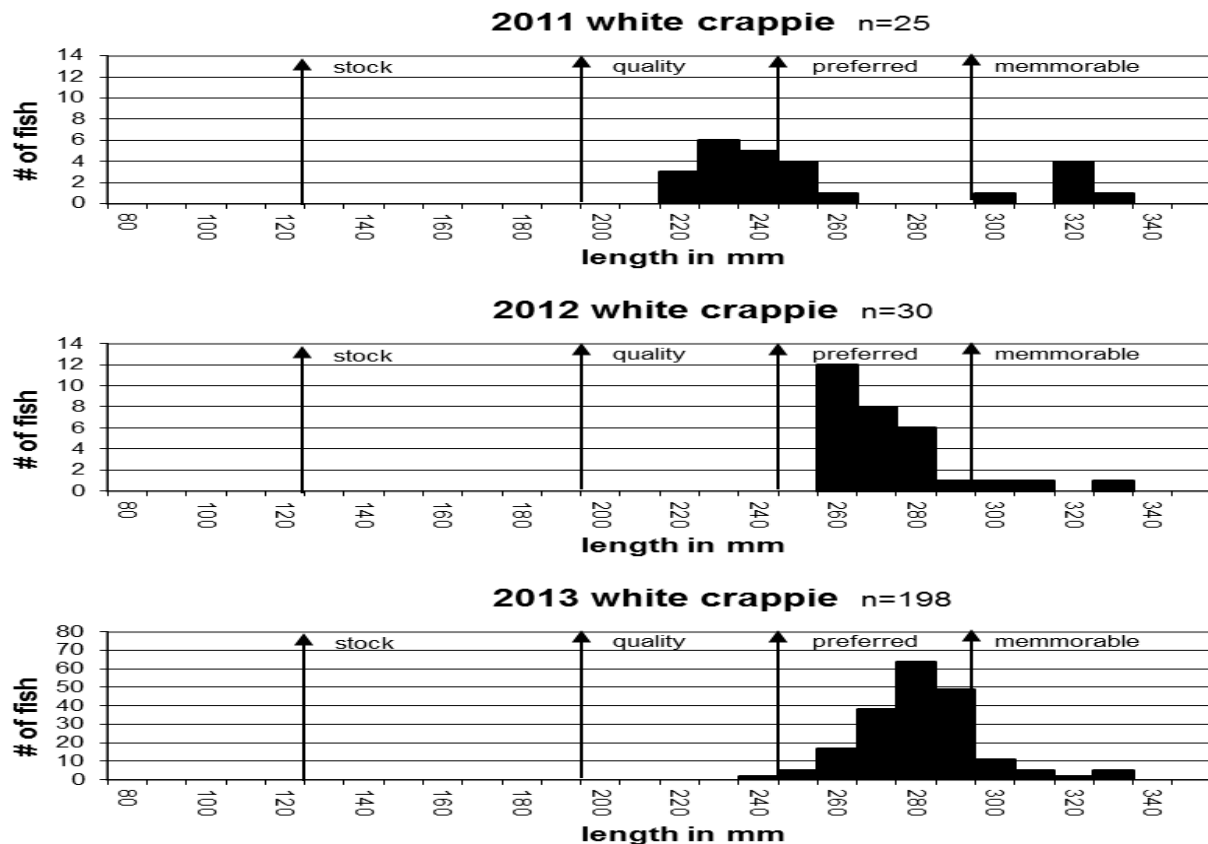


Figure 5. Length frequencies of White Crappie collected in trap nets from Belle Fourche Reservoir, Butte County, South Dakota, 2011-2013.

RECOMMENDATIONS

1. Continue conducting lake surveys annually to evaluate fish populations and monitor regulation effects.
2. Stock adult Gizzard Shad annually to maintain a forage population for Walleye as over winter survival of Gizzard Shad can be poor.
3. Place Christmas Tree reefs in the reservoir to provide Yellow Perch spawning habitat and fish cover when low water exists, and to enhance other forage populations when the Gizzard Shad are not an available forage.

APPENDIX

Appendix A. Stocking history, including year, number, species and size of fish for Belle Fourche Reservoir, Butte County, South Dakota, 2003-2013.

Year	Number	Species	Size
2003	171,893	Walleye	Fingerling
	18,436	Rainbow Trout	Fingerling
	1,500	Tiger Muskellunge	Large fingerling
	102	Gizzard Shad	Adult
2004	1,605	Tiger Muskellunge	Large fingerling
	120	Gizzard Shad	Adult
2005	182	Gizzard Shad	Adult
	2,263	Splake Trout	Fingerling
2006	96	Yellow Perch	Adult
2007	52,800	Rainbow Trout	Fingerling
2008	4,600	Rainbow Trout	Fingerling
	59	Gizzard Shad	Adult
2009	74	Gizzard Shad	Adult
2010	18	Gizzard Shad	Adult
	415,406	Walleye	Fingerling
2011	175	Gizzard Shad	Adult
2012	37	Gizzard Shad	Adult
	2,507	Yellow Perch	Adult
2013	111	Gizzard Shad	Adult
	660	Bluegill	Adult